

# A revision of the Suctoria (Ciliophora, Kinetofragminophora) 4. *Podophrya* and its morphological relatives

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## Introduction

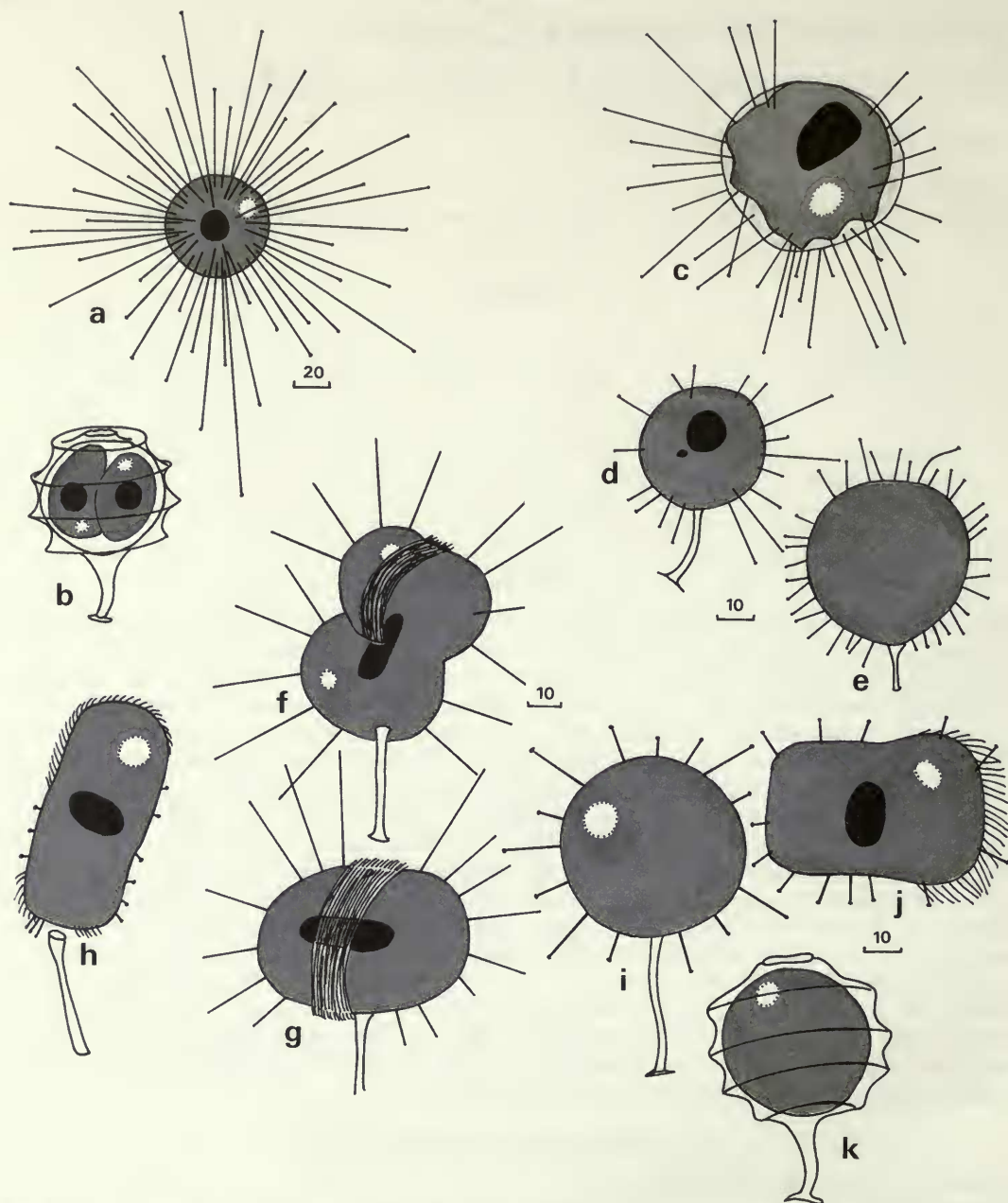
The species of the two well-known genera *Podophrya* Ehrenberg, 1833 and *Sphaerophrya* Claparède and Lachmann, 1859 and the two lesser known *Parapodophrya* Kahl, 1931 and *Mucophrya* Gajewskaja, 1933 are the subjects for consideration in this the fourth part of the series. It will immediately be noticed that the genus *Sphaerophrya* has here been treated as a synonym of *Podophrya*. The two genera were originally distinguished by the presence of a stalk in *Podophrya* and the absence of one in *Sphaerophrya*. However it has long been known that the stalk is often lost by several species of *Podophrya* and apparently some *Sphaerophrya* species occasionally develop one. The presence of a cyst with a stalk has also been used as a distinguishing character but it should be appreciated that this is based on few observations and a similar stage may yet be found in *Sphaerophrya*. Another possible method of distinguishing the two genera investigated by the present author was based on the observation that the ciliary rows in *Podophrya* species are arranged transversely while those in many traditional *Sphaerophrya* species are arranged longitudinally. However examination of the description of bud formation in the type species *Podophrya fixa* Ehrenberg, 1833 by Penard (1920) clearly shows that while the kineties are initially transverse they become longitudinally orientated as the bud elongates. It is clear therefore that there is no stable character by which to distinguish the two genera and under such circumstances they must be synonymised, indeed Corliss (1979) indicated that such a step might be necessary in his taxonomic review of the ciliates.

## Genus *PODOPHRYA* Ehrenberg, 1833

*Sphaerophrya* Claparède and Lachmann, 1859

*Kystopus* Jankowski, 1967

The morphology of *Podophrya* is simple in comparison to many other suctoria and several features indicate that they could be regarded as primitive. Most are simple spheres with an even distribution of capitate tentacles radiating out from the body. Some are without a stalk and float freely in the water while others are attached by means of a stalk to vegetation and inanimate objects, only rarely are they found attached to aquatic arthropods. Several species have become endo- or ectoparasites of ciliated protozoa and in some cases the species may only be distinguished by its association with a particular host. However, it should be noted that the degree



**Fig. 1.** *Podophrya fixa*: (a,b) adult and cyst after Collin, 1912; (c) after Fukui & Morishita, 1962 (called *P. variabile*); (d) after Ghosh, 1929 (called *P. bengalensis*); (e) after Sand, 1899 (called *P. brevipoda*); (f,g,h) budding and transformation of adult into motile form after Penard, 1920; (i,j,k) adult, embryo and cyst after Collin, 1912.

of specificity of these parasites has not been determined and some may be further synonymised as more information becomes available.

The relatively primitive nature of *Podophrya* is shown by its method of reproduction which, in contrast to the other genera so far considered (Curds, 1985*a, b, c*), is by a type of external budding known as 'pseudo-scissiparité' (Batisse, 1975). In this type of budding the mother cell

enlarges and divides across the cell as is the normal method of division in ciliates but here a field of kinetosomes migrates from the mother to become the ciliary bases of the motile bud (see Fig. 1f). The cilia initially develop as transverse rows but in some cases these may later develop into longitudinal rows because of elongation by the bud in that axis. Some species have been reported to have the ability for the whole cell to transform itself (Fig. 1g, h) into a motile bud-like form which is rather reminiscent of telotroch formation in the peritrichs and presumably plays a similar role in enabling the organism to move away from one attachment site to another if necessary. Cyst formation is well documented in several species of *Podophrya*. Cysts are generally stalked and heavily ribbed and the numbers of ribs have been used as criteria for species identification. Multiple fission of the suctorian within the cyst has been reported in *Podophrya*.

### Diagnosis of *Podophrya*

Typically freshwater, rarely marine, suctorians whose outline shape varies from spherical to ovoid. Lorica absent, some species borne upon a stalk but this may often be absent. Some species free-living, others are parasitic in or on other ciliates. Free-living species usually attached to aquatic vegetation or inanimate objects and only rarely to invertebrates. Tentacles reduced in the parasitic species but are capitate, long and numerous in the free-living ones. Tentacles distributed all over body, not in fascicles. Actinophores absent. Cysts sometimes stalked and often heavily ribbed. Reproduction by external buds (division into parts), buds ciliated with 3–12 rows of cilia that initially develop transversely. In some cases the ciliary rows become transformed into longitudinal rows as the bud elongates. Buds usually with rudimentary tentacles. Whole cell may convert into a motile bud-like state.

### Key to the species of *Podophrya*

1	Free-living .....	2
	Parasitic .....	25
2	With stalk .....	3
	Without stalk .....	14
3	Ectocommensal on marine crustacea, stalk very short .....	<i>P. niphargi</i>
	Not on crustacea, stalk at least half body length .....	4
4	Many tentacles present .....	5
	Only 2 tentacles present .....	<i>P. flexilis</i>
5	Tentacles of same length .....	7
	Tentacles of two different lengths .....	6
6	Freshwater, long mobile tentacles .....	<i>P. globulifera</i>
	Brackish, long immobile tentacles .....	<i>P. halophila</i>
7	Stalk striated transversely .....	<i>P. fallax</i>
	Stalk not striated .....	8
8	Diameter of zooid less than 15 $\mu\text{m}$ .....	9
	Diameter of zooid greater than 20 $\mu\text{m}$ .....	10
9	Several contractile vacuoles present .....	<i>P. spenceri</i>
	Single contractile vacuole present .....	<i>P. gracilis</i>
10	Stalk widens markedly at junction with zooid .....	<i>P. macrostyla</i>
	Stalk more or less parallel with zooid .....	11
11	Thick external layer to zooid .....	<i>P. maupasi</i>
	No thick external layer to zooid .....	12
12	Body spherical .....	13
	Body spherical but has posterior projection at junction with stalk .....	<i>P. sandi</i>
13	Stalked cyst with 4 ribs .....	<i>P. fixa</i>
	Stalked cyst with many (about 12) ribs .....	<i>P. libera</i>
14	Body hemispherical, attached by body side .....	<i>P. simplex</i>
	Body ovoid or spherical, not attached by body side .....	15
15	Without contractile vacuole, macronucleus elongate .....	<i>P. massiliensis</i>
	With contractile vacuole, macronucleus spherical to ovoid .....	16
16	Single contractile vacuole .....	21
	Two or more contractile vacuoles .....	17



17	Several contractile vacuoles .....	18
	Two contractile vacuoles .....	19
18	Spherical body, floats with aid of non-pulsating gaseous vacuole ..... <i>P. hydrostatica</i>	
	Oval body, without gaseous vacuole ..... <i>P. ovata</i>	
19	Tentacles few (< 10) ..... <i>P. natans</i>	
	Tentacles many (> 30) .....	20
20	Tentacles grouped in bunches ..... <i>P. melosirae</i>	
	Tentacles randomly distributed ..... <i>P. magna</i>	
21	Capable of movement by use of tentacles or body .....	23
	Static, cannot move by use of tentacles .....	22
22	Tentacles restricted to one small area of body ..... <i>P. parva</i>	
	Tentacles distributed all over body surface .....	24
23	Body shape always spherical ..... <i>P. libera</i>	
	Body shape changeable, often irregular ..... <i>P. amoeboides</i>	
24	Tentacles tend to be long, forms stalked cyst ..... <i>P. libera</i>	
	Tentacles tend to be short, without stalked cyst ..... <i>P. sol</i>	
25	Suctoria attached to surface of ciliate host .....	26
	Suctoria lie beneath surface of ciliate host .....	30
26	Body spherical, tentacles without wide bases .....	27
	Body irregular, tentacles with wide bases ..... <i>P. atypica</i>	
27	Attached to <i>Nassula</i> in clusters ..... <i>P. parasitica</i>	
	Different host .....	28
28	Attached to <i>Stokesia</i> in clusters ..... <i>P. stokesii</i>	
	Different host .....	29
29	Attached to hypotrichs ( <i>Oxytricha</i> , <i>Stylonychia</i> and <i>Paruroleptus</i> ) ..... <i>P. pusilla</i>	
	Attached to <i>Vorticella</i> in clusters ..... <i>P. epizooica</i>	
30	Suctoria lie in open surface pockets in cytoplasm of ciliate host .....	31
	Suctoria lie deep within cytoplasm of ciliate host .....	32
31	Lies in cytoplasmic pockets of <i>Nassula</i> ..... <i>P. iftodi</i>	
	Lies in cytoplasmic pockets of <i>Stylonychia lemnae</i> ..... <i>P. grelli</i>	
32	Contained within host <i>Stentor</i> .....	37
	Contained within other hosts .....	33
33	Contained within host <i>Paramecium</i> ..... <i>P. parameciorum</i>	
	Contained within other hosts .....	34
34	Contained within hypotrichs .....	35
	Contained within host <i>Bursaria</i> ..... <i>P. insolita</i>	
35	Bud has cilia in transverse rings ..... <i>P. pusilla</i>	
	Bud has cilia arranged longitudinally .....	36
36	Lies within oral funnel of <i>Euplotes</i> ..... <i>P. canelli</i>	
	Lies within body of <i>Urostyla</i> or <i>Stylonychia</i> ..... <i>P. urostylae</i>	
37	Bud with 2 contractile vacuoles and capitate tentacles ..... <i>P. stentoris</i>	
	Bud with 1 contractile vacuole and non-capitate tentacles ..... <i>P. doliolum</i>	

### Species descriptions of *Podophrya*

#### *Podophrya fixa* (Muller, 1786) Ehrenberg, 1833

*Trichoda fixa* Muller, 1786

*Peritricha cometa* Bory, 1825

*Actinophrys pedicellata* Dujardin, 1841

*Orcula trochus* Weisse, 1847 (the cyst)

*Actinophrys difformis* Perty, 1852

*Actinophrys sol* Stein, 1854 *pro parte*

*Podophrya brevipoda* Sand, 1899

*Podophrya bengalensis* Ghosh, 1929

*Podophrya variabile* Fukui and Morishita, 1962

DESCRIPTION (Fig. 1). This the type species is a small to medium (50–75 µm diameter), freshwater or marine, aloricate suctorian that is spheroidal in shape. Typically free-living but there is one



report (Penard, 1920) of it as an endoparasite of the hypotrichous ciliate *Stylonychia mytilus* although perhaps it could have been *P. grelli*. Often, but not always, borne upon a stalk that is variable in length but usually about the same length as the body diameter. Tentacles capitate, variable in length, radiating out from all over surface of body. Free-living forms attached to vegetation and inanimate objects. Macronucleus ovoid and centrally located. Single contractile vacuole. Adult has ability to totally transform into a ciliated bud-like form (Fig. 1f) enabling it to swim away from its stalked attachment to a more favourable site.

Reproduction by pseudo-scissiparity producing a bud that is approximately the same size as the mother cell with about 12 longitudinal rows of cilia and several rudimentary tentacles. Well developed stalked cyst produced with 4 prominent transverse ribs. Fission can occur within cyst to produce up to 4 daughter cells (Fig. 1b).

*Podophrya amoeboides* (Sand, 1899) n. comb.

*Trichophrya amoeboides* Sand, 1899

*Trichophrya variabilis* Sand, 1899

DESCRIPTION (Fig. 2). Small (15–40  $\mu\text{m}$  long), freshwater or marine, aloricate suctorian that is oval, lozenge, pyriform or irregular with lobes. Body able to slowly change its shape. Free-living, without stalk, found amongst algae and hydroid colonies. Tentacles capitate, of variable length and radiating out from all over the body surface. Movement is achieved by means of tentacles and body changes. One tentacle is extended forward and attaches itself distally. It then contracts and pulls the entire organism forward. The action apparently deforms the body by elongating that part of the cytoplasm to which the contracting tentacle is attached, although Penard (1920) states that this species can also move by means of its body in a manner comparable to leucocytes. Central spherical macronucleus, single anterior or central contractile vacuole. Reproduction and budding not described but Penard (1920) saw a bud, which he suspected to derive from this

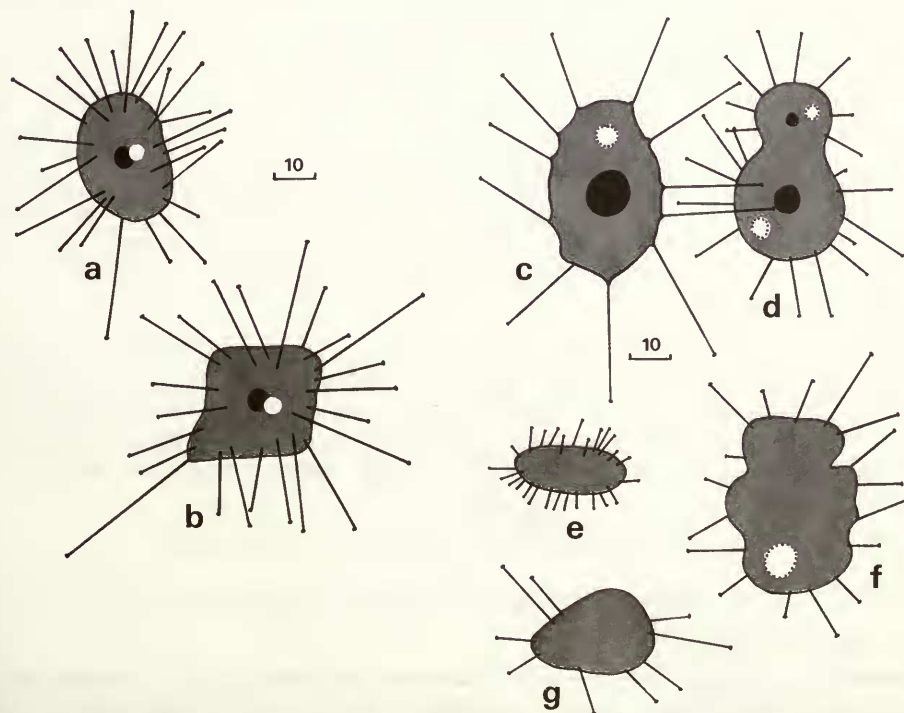


Fig. 2. *Podophrya amoeboides*: (a,b) after Sand, 1899 (called *Trichophrya amoeboides*); (c,d) after Penard, 1920 (called *Trichophrya variabilis*); (e,f,g) after Sand, 1899 (called *Trichophrya variabilis*).

species, that was an elongated ovoid covered in ciliary rows. Cyst formation also thought to occur (Penard, 1920).

NOTE. Since Penard (1920) discovered *T. variabilis* in salt water there seems to be no reason for distinguishing between it and *T. amoeboides*. The latter mentioned species takes precedence since it was described on an earlier page than *T. variabilis*.

***Podophrya atypica* (Gonnert, 1935) n. comb.**

*Parapodophrya atypica* Gonnert, 1935

DESCRIPTION (Fig. 3). Small (10  $\mu\text{m}$  diameter), freshwater, aloricate suctorian that is highly irregular in shape. Ectoparasitic on the ciliate *Colpoda*. Tentacles prominently capitate, length about three times body diameter, bases greatly expanded. One tentacle firmly embedded into cytoplasm of host cell. Ovoid macronucleus and single contractile vacuole centrally positioned. Mode of reproduction and bud morphology undescribed.

NOTE. Until the bud and budding are fully described the true taxonomic position for this species will be unknown. However it was thought more advisable to transfer it to *Podophrya* since all other species of *Parapodophrya* are free-living and the similarity in tentacles was not considered to be sufficient to retain it in the latter genus.

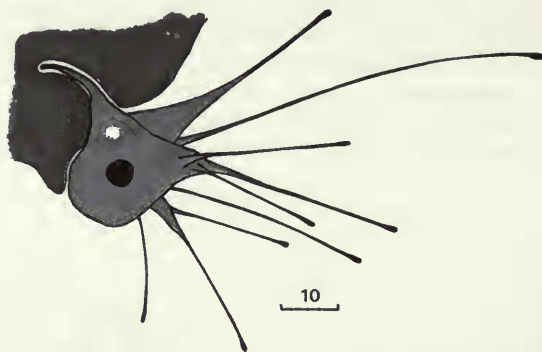


Fig. 3. *Podophrya atypica* after Gonnert, 1935 (called *Parapodophrya atypica*).

***Podophrya canelli* (Clement, 1967) n. comb.**

*Sphaerophrya canelli* Clement, 1967

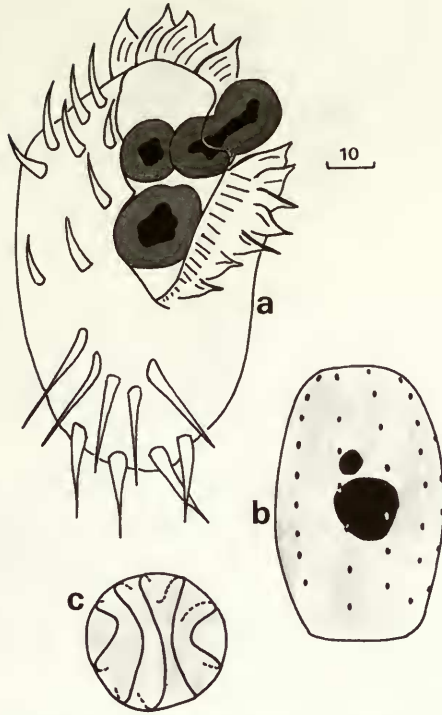
DESCRIPTION (Fig. 4). Small (10–25  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Endoparasite of the hypotrichous ciliates *Euplotes eurystomus* and *E. patella*, usually located in the peristomial depression of the host cell. Stalk absent. Some short capitate tentacles present randomly distributed over body surface. Central spherical macronucleus, single contractile vacuole. Reproduction by pseudo-scissiparity. Bud ovoid with 4 or 5 parallel longitudinal rows of cilia. Cyst not formed.

NOTE. Originally described by Canella (1957) but not given a specific name.

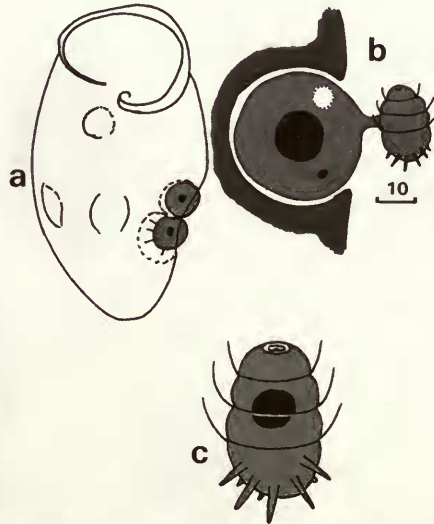
***Podophrya doliolum* (Penard, 1920) n. comb.**

*Sphaerophrya doliolum* Penard, 1920

DESCRIPTION (Fig. 5). Small (25–35  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Parasitic in surface cytoplasmic pockets in the ciliate *Stentor niger*. Stalk absent. Few short tentacles in adult. Central ovoid macronucleus with well-displaced micronucleus. Single contractile vacuole. Reproduction by rapid pseudo-scissiparity forming groups of parasites in the



**Fig. 4.** *Podophrya canelli*: (a) adults inside host *Euplotes*; (b,c) embryos, lateral and apical aspects. All after Clement, 1967 (called *Sphaerophrya canelli*).



**Fig. 5.** *Podophrya doliolum*: (a) adults on host *Stentor*; (b,c) budding and embryo. All after Penard, 1920 (called *Sphaerophrya doliolum*).

host. Some buds develop into ovoid ciliated embryos carrying 3 well-displaced transverse rings of cilia and rudimentary tentacles at the posterior end. An adhesive disc at the anterior pole.

NOTE. Penard distinguished this species from *Podophrya stentoris* on the basis of the ciliary rings and their distribution in *Podophrya doliolum*.



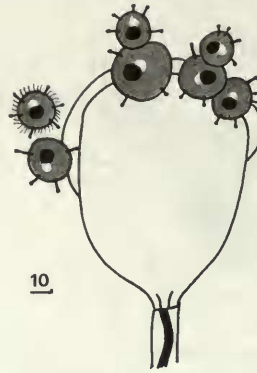


Fig. 6. *Podophrya epizoica* growing on *Vorticella campanula*, after Hammann, 1952.

***Podophrya epizoica* Hammann, 1952**

DESCRIPTION (Fig. 6). Small (20–35  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Ectoparasitic on the peritrichous ciliate *Vorticella campanula*, usually close to the peristomial lip. Stalk absent. Capitate tentacles randomly distributed over entire body surface but relatively few, about 6, in number. Attachment to the host is via a large embedded tentacle. Single contractile vacuole. Large central macronucleus. Reproduction by pseudo-scissiparity. Bud not described in detail but has cilia and rudimentary capitate tentacles.

***Podophrya fallax* Dingfelder, 1962**

DESCRIPTION (Fig. 7). Medium (60  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living, borne upon stalk whose length is usually at least twice the body diameter. Stalk striated

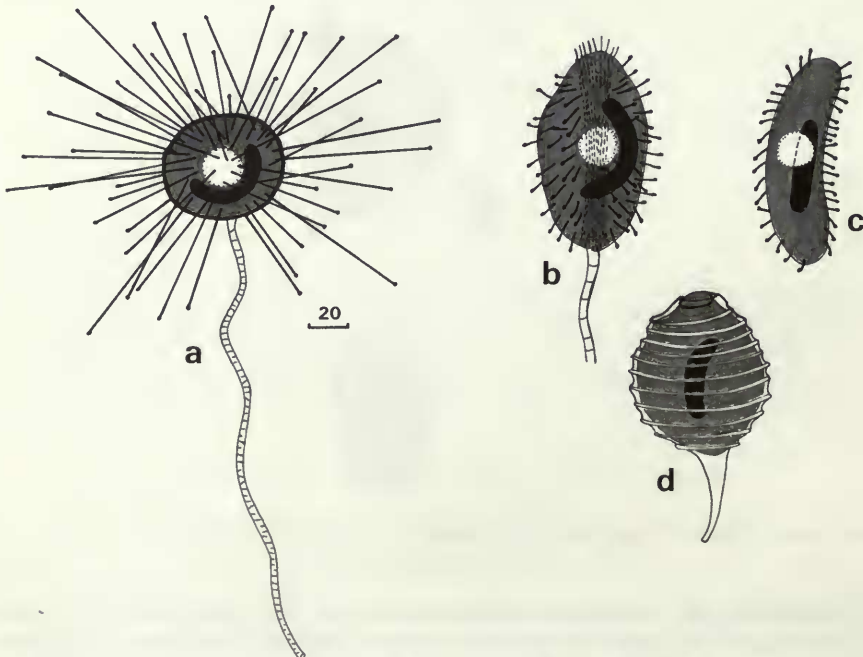


Fig. 7. *Podophrya fallax*: (a) adult; (b) transformation of adult into motile form; (c,d) embryo and cyst. All after Dingfelder, 1962.

transversely. Tentacles capitate, radiating out from all over surface of body. Attached to vegetation and inanimate objects in ponds. Macronucleus sausage-shaped, curving around the single central contractile vacuole. Adult has ability to totally transform itself into a ciliated bud-like form whose cilia are arranged in many longitudinal rows. Reproduction by pseudo-scissiparity producing a bud whose size approximates to that of the mother cell. Well developed stalked cyst produced with about 11 prominent ribs.

*Podophrya flexilis* Kellicott, 1887

*Tokophrya flexilis* (Kellicott, 1887) Butschli, 1889

DESCRIPTION (Fig. 8). Small (25–50  $\mu\text{m}$  diameter), freshwater, ovoid, aloricate suctorian. Free-living, borne upon a stalk that is shorter than the body diameter. Attached to the stalks of the peritrichous ciliate *Epistylis digitalis* on the crustacean *Cyclops*. Capitate tentacles, few, 2–4, about six times as long as body diameter, extensible and flexible. Macronucleus ovoid, located in posterior body half. Contractile vacuole situated apically. Reproduction and bud not described.

*Podophrya globulifera* Kahl, 1931

DESCRIPTION (Fig. 9). Medium (50–70  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living, borne upon a stalk whose length is about twice the body diameter. Tentacles of two

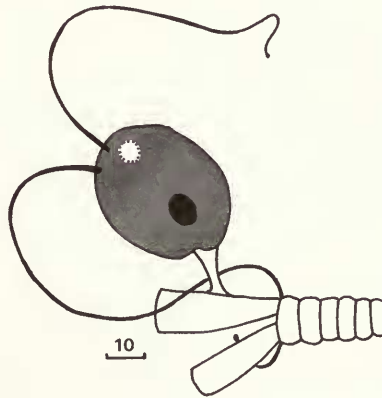


Fig. 8. *Podophrya flexilis* after Kellicott, 1887.

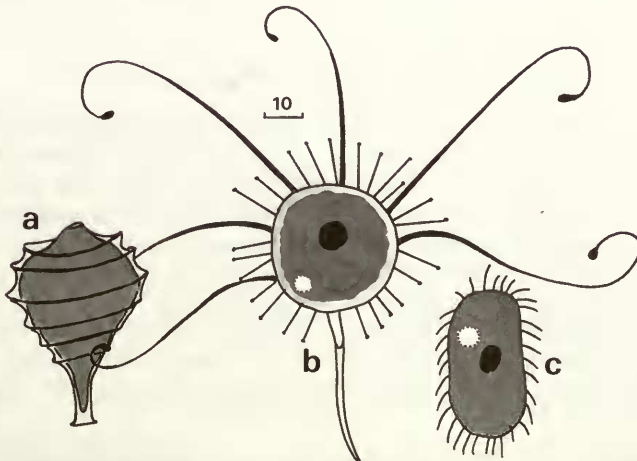


Fig. 9. *Podophrya globulifera*: (a,b,c) cyst, adult and embryo after Kahl, 1931.

types, many short capitate tentacles and fewer long, extensible capitate tentacles. Fascicles absent, tentacles radiate out from all over body surface. Attached to vegetation and inanimate objects. Spherical macronucleus centrally located, single contractile vacuole. Reproduction by pseudo-scissiparity producing buds whose ciliary rows are longitudinally orientated. Well developed stalked cyst bearing about six prominent transverse ribs.

*Podophrya gracilis* Calkins, 1902

DESCRIPTION (Fig. 10). Small (8  $\mu\text{m}$  diameter), marine, spherical, aloricate suctorian. Free-living, borne upon a stalk whose length is about five times the body diameter. Body covered in short capitate tentacles. Attached to inanimate objects. Spherical macronucleus located in posterior half of body. One or two contractile vacuoles present. Reproduction and bud not described.

NOTE. Collin (1912) was of the opinion that this organism was a heliozoan but Kahl (1934) disagreed and the true status is still uncertain.

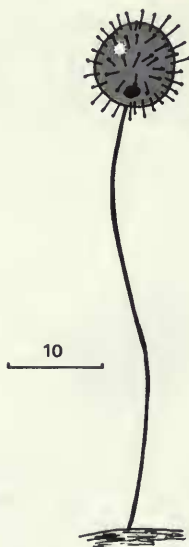


Fig. 10. *Podophrya gracilis* after Calkins, 1902.

*Podophrya grelli* Dieckmann, 1985

DESCRIPTION (Fig. 11). Small (25–50  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living or endoparasitic in the hypotrichous ciliate *Stylonychia lemnae* in which it lies just beneath the surface in cytoplasmic pockets that remain open to the external environment. Parasite is apparently host-specific. Few short capitate tentacles when inside host. Ciliated buds produced by unequal to equal exogenous budding. Conjugation of parasite occurs after degeneration of host. Stalked cysts with 5 ribs similar to those of *P. fixa* are produced outside host after conjugation. The final rib in *P. grelli* is directed posteriorly (Fig. 11) towards the stalk while that of *P. fixa* is directed postero-laterally (Figs 1b, 1k). Multiple fission within cyst produces infective buds that are indistinguishable from buds of the asexual generation. Buds or swimmers small (15–20  $\mu\text{m}$  long), oval with few rudimentary tentacles. There are 6–7 kineties and a bunch of posterior caudal cilia.

NOTE. This may be the suctorian parasite seen by Penard (1920) and thought to be *P. fixa* which is similar but not usually parasitic.



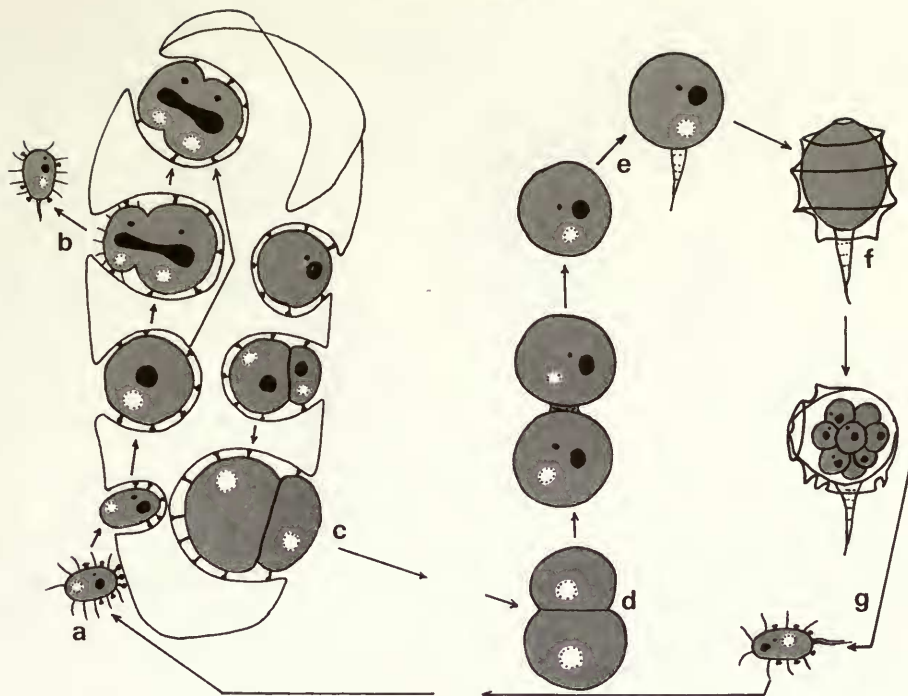


Fig. 11. *Podophrya grelli* after Dieckmann, 1985. Life cycle stages (a–c) inside host, (d–g) in culture fluid. (a) ciliated swarmer infects host; (b) budding produces more swimmers; (c) conjugation, conjugants released when host degenerates; (d) conjugants in culture medium; (e) exconjugant develops stalk; (f) stalked cyst; (g) swimmers produced after multiple division in cyst.

### *Podophrya halophila* Kahl, 1934

DESCRIPTION (Fig. 12). Medium (50–90  $\mu\text{m}$  diameter), marine, spherical, aloricate suctorian. Free-living, borne upon a stalk whose length approximates to that of the body diameter. Body covered in capitate tentacles of two lengths, many short tentacles and fewer tentacles that are about the same length as the body. Attached to inanimate objects. Spherical macronucleus, single contractile vacuole. Reproduction by pseudo-scissiparity producing buds whose ciliary kinetics are longitudinally orientated. There are two contractile vacuoles in the bud.

### *Podophrya hydrostatica* (Engelmann, 1878) n. comb.

*Sphaerophrya hydrostatica* Engelmann, 1878

DESCRIPTION (No figure). Medium (80–90  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living, without stalk, floating freely in water amongst *Lemna*. Body covered in many long capitate tentacles. Numerous small contractile vacuoles and a large, half body diameter, non-contractile gaseous vacuole to aid flotation of the organism. Reproduction and bud not described.

NOTE. Although apparently seen and described on several occasions, this species has not yet been figured.

### *Podophrya iftodi* (Clement-Iftode, 1967) n. sp.

*Sphaerophrya* sp. Clement-Iftode, 1967

DESCRIPTION (Fig. 13). Small (10–30  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian.

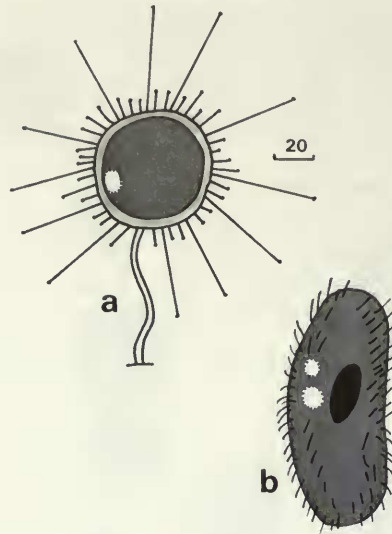


Fig. 12. *Podophrya halophila*: (a,b) adult and embryo after Kahl, 1934.

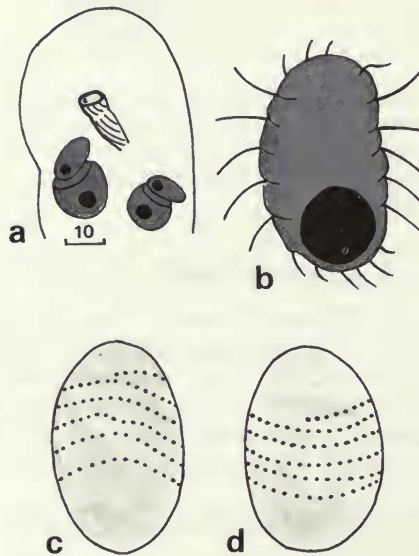


Fig. 13. *Podophrya iftodi*: (a) adults in host *Nassula elegans*; (b,c,d) embryos and ciliation. All after Clement-Iftode, 1967 (called *Sphaerophrya* sp.).

Parasitic in the ciliate host *Nassula elegans* where it inhabits pockets deep within the pellicle of the host. Stalk and cyst absent. Several short capitate tentacles distributed over body surface. Centrally located ovoid macronucleus. Reproduction by pseudo-scissiparity. Ovoid buds with 5 or 6 transversely orientated ciliary rings, and macronucleus in posterior position.

NOTE. Fauré-Fremiet (1945) described a suctorian parasite of *Nassula ornata* which he called *Podophrya parasitica*. This can easily be distinguished from *Podophrya iftodi* by several features. *P. parasitica* remains on the surface of the host and does not live in pockets. Furthermore its buds have longitudinally orientated ciliary lines.

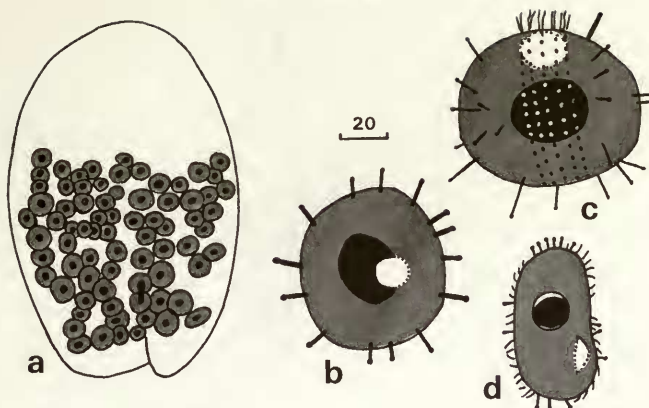


Fig. 14. *Podophrya insolita*: (a) adults in host *Bursaria*; (b,c,d) adult and embryos. All after Jankowski, 1973.

***Podophrya insolita* Jankowski, 1973**

DESCRIPTION (Fig. 14). Medium (50–80  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Endoparasite of the ciliate *Bursaria truncatella*. Stalk and cyst absent. Several short capitate tentacles randomly distributed over body surface. Centrally located macronucleus. Reproduction by pseudo-scissiparity producing daughters that possess tentacles but not cilia. Synchronous total transformation of daughter cells into motile forms called 'trophotomites' enables the infestation to be transmitted from host to host. Young trophotomites with above five transverse ciliary rings elongate into mature laterally flattened oval tomites with longitudinal kineties and some rudimentary tentacles.

***Podophrya libera* Perty, 1852**

*Podophrya fixa* var. *algeriensis* Maupas, 1876

DESCRIPTION (Fig. 15). Small to medium (30–80  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living, sometimes borne upon a slender stalk whose length approximates to that of the body but often detached and floating freely in the water. Body covered with many capitate tentacles of three different lengths from 3 to 6 times the body length. Centrally located spherical macronucleus, single marginal contractile vacuole. Cyst spheroidal, stalked, carrying 8–16 prominent transverse rings. Reproduction by pseudo-scissiparitous budding producing an unciliated bud which then totally transforms into a ciliated motile form.

***Podophrya macrostyla* Stokes, 1885**

*Discophrya macrostyla* Collin, 1912

DESCRIPTION (Fig. 16). Medium (50–55  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living, attached via a stalk to inanimate objects and aquatic vegetation. Stalk wide, 8  $\mu\text{m}$ , gradually enlarging to 15  $\mu\text{m}$  when it forms a cup-like structure to join the zooid. Covered in capitate tentacles. Subcentrally located oval macronucleus, single marginal contractile vacuole. Reproduction and bud not described.

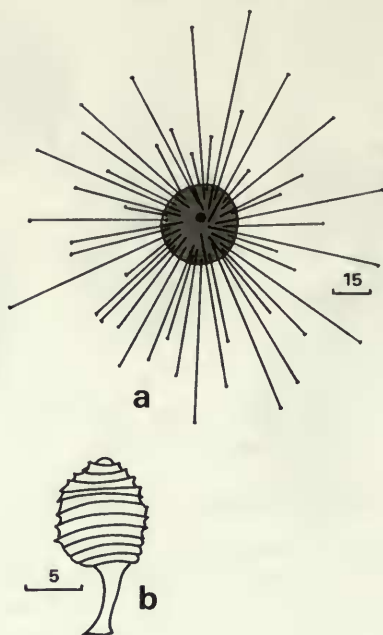
***Podophrya magna* (Maupas, 1881) n. comb.**

*Sphaerophrya magna* Maupas, 1881

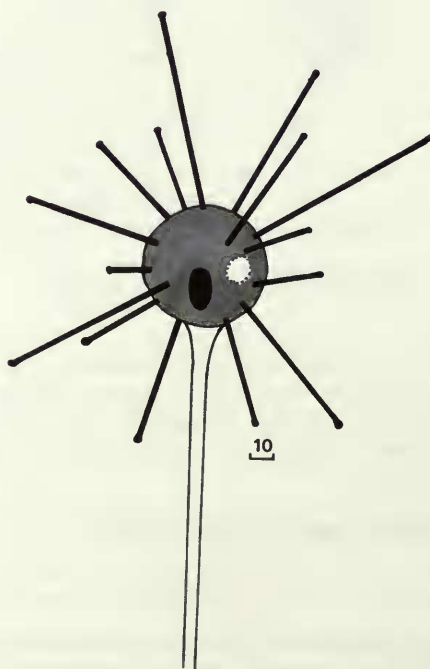
*Sphaerophrya pusilla* Sand, 1901 *pro parte*

DESCRIPTION (Fig. 17). Small to medium (35–50  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living, stalk absent. Covered in capitate tentacles whose extended lengths approximate to that of the body. Eccentric spherical macronucleus, one or two contractile vacuoles. Reproduction by pseudo-scissiparity.





**Fig. 15.** *Podophrya libera*: (a) adult after Holm, 1925; (b) cyst after Spencer, 1917.



**Fig. 16.** *Podophrya macrostyla* after Stokes, 1885.

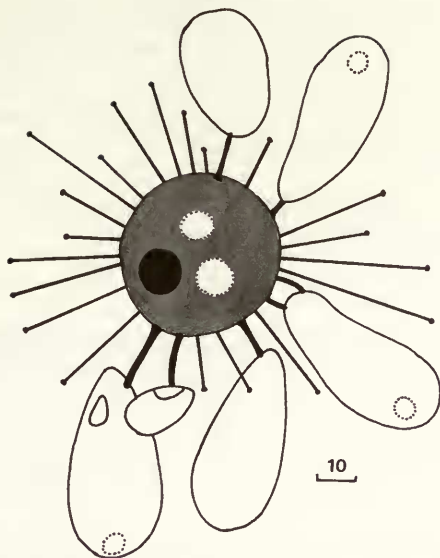


Fig. 17. *Podophrya magna* after Maupas, 1881 (called *Sphaerophrya magna*).

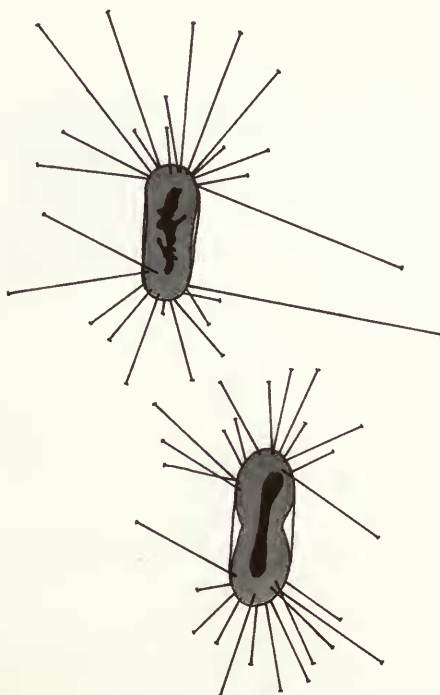


Fig. 18. *Podophrya massiliensis* after Gourret and Roeser, 1886 (called *Sphaerophrya massiliensis*). No scale given.

***Podophrya massiliensis* (Gourret and Roeser, 1886) n. comb.**

*Sphaerophrya massiliensis* Gourret and Roeser, 1886

*Trichophrya massiliensis* Kahl, 1934

**DESCRIPTION** (Fig. 18). Marine, elongated ovoid to cylindrical, aloricate suctorian. Free-living, stalk absent. Capitate tentacles restricted to either end of body. Central region of body slightly

narrower than ends so that the cell membrane visible in this region. Macronucleus, elongate and sometimes irregular. Contractile vacuole absent. Reproduction by pseudo-scissiparity. Buds not described.

NOTE. The transfer of this species into the genus *Trichophrya* by Kahl (1934) cannot be supported since the latter mentioned genus buds endogenously.

***Podophrya maupasi* Butschli, 1889**

*Podophrya fixa* forma *typica* Maupas, 1876

*Podophrya* sp. Maupas, 1881

*Podophrya* or *Sphaerophrya* sp. Florentin, 1899

DESCRIPTION (Fig. 19). Small to medium (16–60  $\mu\text{m}$  diameter), freshwater to brackish, spherical, aloricate suctorian. Free-living, borne upon a stalk that is approximately the same length as the body. Attached to aquatic vegetation and inanimate objects. Covered in 15–20 tentacles that are distributed over the entire body surface. Tentacles slightly trumpet-shaped at their ends. Spherical macronucleus centrally positioned, single marginal contractile vacuole. Cyst spherical, without ribs. Reproduction by pseudo-scissiparity, buds not described.

NOTE. Freshwater form larger (40–60  $\mu\text{m}$ ) than brackish-water form (16–22  $\mu\text{m}$ ).

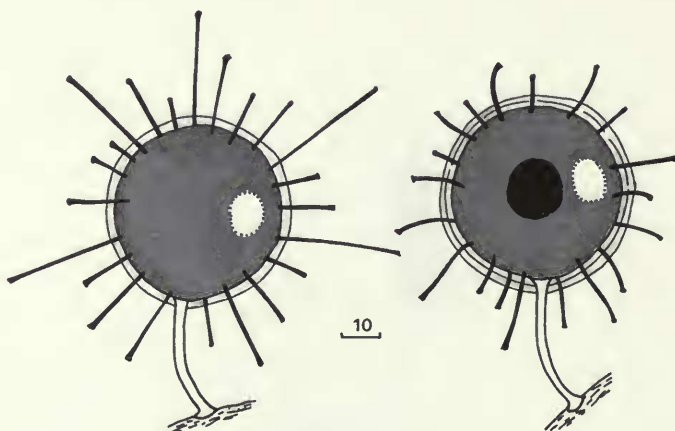


Fig. 19. *Podophrya maupasi* after Collin, 1912.

***Podophrya melosirae* (Gajewskaja, 1933) n. comb.**

*Sphaerophrya melosirae* Gajewskaja, 1933

DESCRIPTION (Fig. 20). Medium (90  $\mu\text{m}$  wide), freshwater, ovoid, aloricate suctorian. Free-living, stalk absent. Attached to aquatic vegetation by the body. Covered in long capitate tentacles that are grouped together in bundles. Spherical centrally positioned macronucleus. Two contractile vacuoles. Reported from Lake Baikal. Reproduction by pseudo-scissiparity.

***Podophrya natans* (Penard, 1920) n. comb.**

*Sphaerophrya natans* Penard, 1920

DESCRIPTION (Fig. 21). Small (25  $\mu\text{m}$  diameter), freshwater, irregularly ovoid, aloricate suctorian. Free-living, stalk absent. Attached to aquatic vegetation and inanimate objects. Few, 5 or 6, long capitate tentacles project from various parts of the cell surface. Spherical central macronucleus, two contractile vacuoles. Reproduction and buds not described.



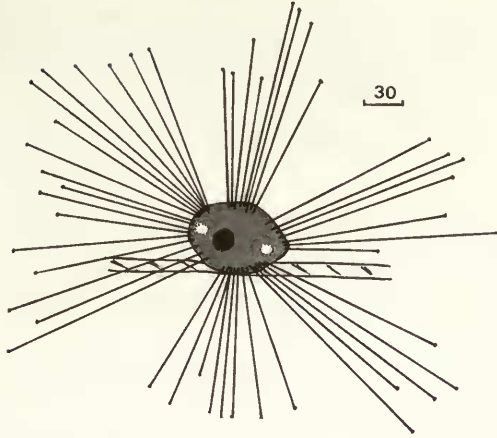


Fig. 20. *Podophrya melosirae* after Gajewskaja, 1933 (called *Sphaerophrya melosirae*).

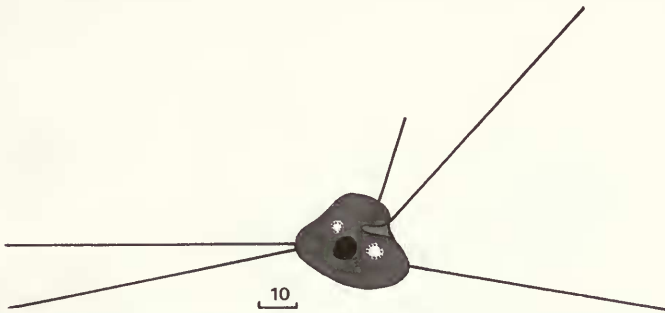


Fig. 21. *Podophrya natans* after Penard, 1920 (called *Sphaerophrya natans*).

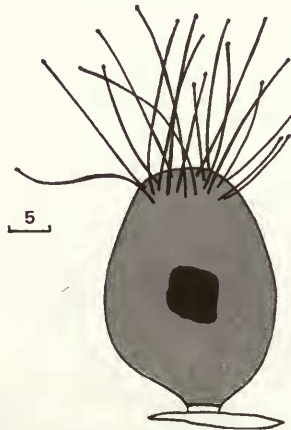


Fig. 22. *Podophrya niphargi* after Strouhal, 1939.

***Podophrya niphargi* Strouhal, 1939**

DESCRIPTION (Fig. 22). Small (24–40  $\mu\text{m}$  long), marine, ovoid, aloricate suctorian. Ectocommensal on the amphipod *Niphargus*. Capitulate tentacles restricted to anterior surface only. Stalk very short, only a few microns long, but with a large basal plate. Central ovoid macronucleus. Reproduction thought to be by exogenous budding although original author was not certain. Buds not described.

NOTE. The position of this species in the genus *Podophrya* should be regarded with caution. There are several features which suggest that this is not the correct genus but the indication that it reproduces by external buds makes it difficult to find a more suitable taxonomic position.

***Podophrya ovata* (Weisse, 1847) n. comb.**

*Actinophrys ovata* Weisse, 1847

*Sphaerophrya ovata* Lachmann, 1859

DESCRIPTION (Fig. 23). Freshwater, ovoid, aloricate suctorian. Free-living, stalk absent. Covered in capitate tentacles attached to aquatic vegetation. Two groups of three contractile vacuoles arranged at either end of the cell. Reproduction and buds not described.

***Podophrya parameciorum* (Maupas, 1881) Jankowski, 1963**

*Sphaerophrya pusilla* Mechnikov, 1864

*Sphaerophrya parameciorum* Maupas, 1881

*Podophrya parameciorum incurcella* Jankowski, 1963

DESCRIPTION (Fig. 24). Small (32  $\mu\text{m}$  diameter), freshwater, spherical aloricate suctorian. Ectoparasite of several species of *Paramecium*. Few short capitate tentacles distributed randomly

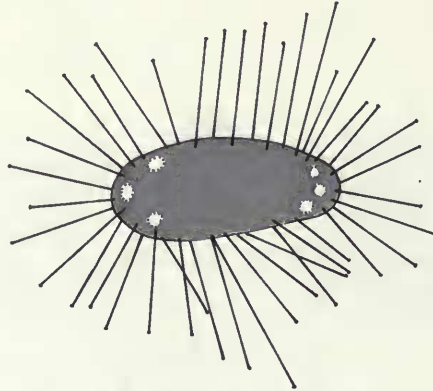


Fig. 23. *Podophrya ovata* after Weisse, 1847 (called *Actinophrys ovata*). No scale given.

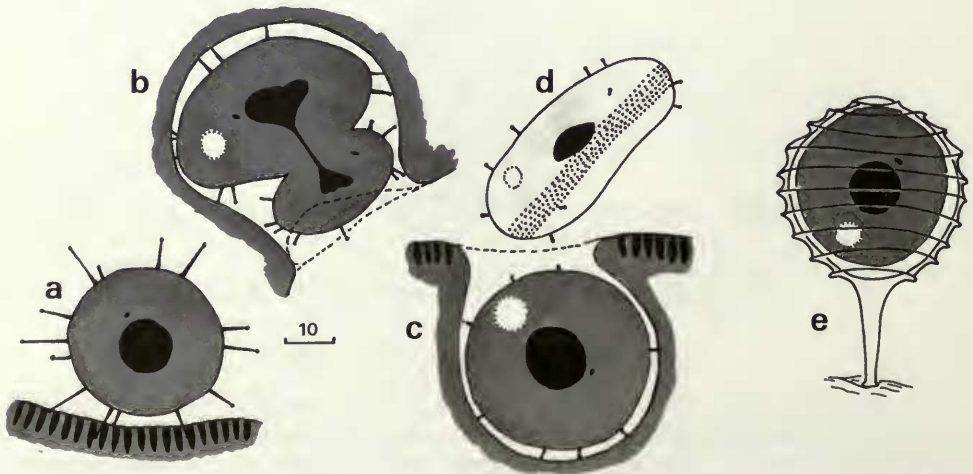


Fig. 24. *Podophrya parameciorum*: (a) adult on outside of host *Paramecium*; (b,c) parasites embedded in pockets in host cytoplasm; (d,e) embryo and cyst. All after Jankowski, 1963.

over surface area. Lives in open pockets in the cytoplasm of the host. Central spherical macronucleus, single marginal contractile vacuole. Reproduction by pseudo-scissiparity. Ciliated buds produced which have six longitudinal kineties. Adult can also exist outside of host and is capable of producing a stalked cyst with about ten prominent transverse ridges.

NOTE. Mechnikov (1864) was the first to describe a suctorian parasite of *Paramecium* which he mistook for *Sphaerophrya pusilla*.

*Podophrya parasitica* Fauré-Fremiet, 1945

DESCRIPTION (Fig. 25). Small (25–50  $\mu\text{m}$  diameter), freshwater, spherical aloricate suctorian. Ectoparasite of *Nassula ornata*. Attached to exterior of host by capitate tentacles that radiate out from the entire surface area of the body. Always remains on the surface of the host, never beneath in pockets usually located at the posterior end of the host. Stalk absent. Large central spherical macronucleus, single marginal contractile vacuole. Reproduction by pseudo-scissiparity producing buds with about 7 rows of longitudinally orientated cilia and a few posterior rudimentary tentacles. Adult can exist attached to inanimate objects and encyst producing a stalked cyst with five prominent ridges.

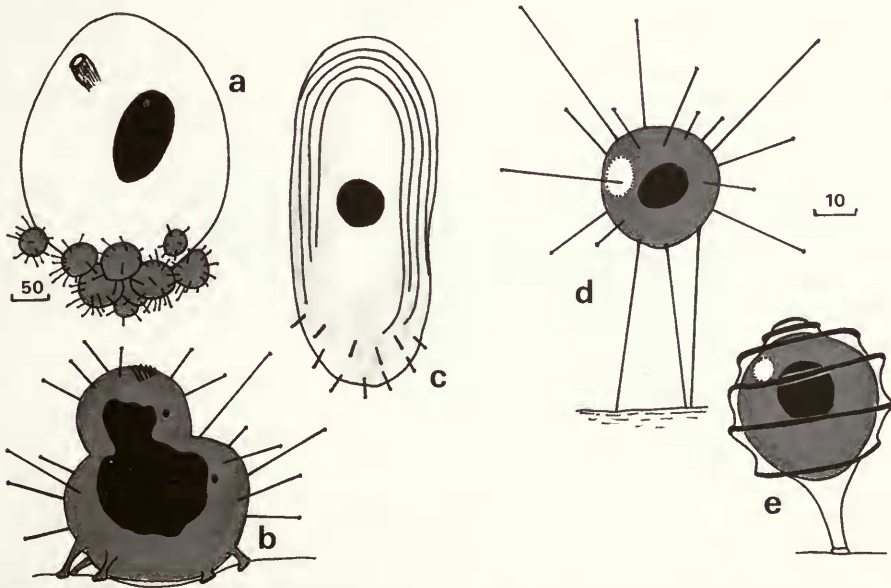


Fig. 25. *Podophrya parasitica*: (a) adults on host *Nassula ornata*; (b) budding; (c) ciliation of embryo; (d,e) adult and cyst. All after Fauré-Fremiet, 1945 except (c) which is after Guilcher, 1951.

*Podophrya parva* Greef, 1888

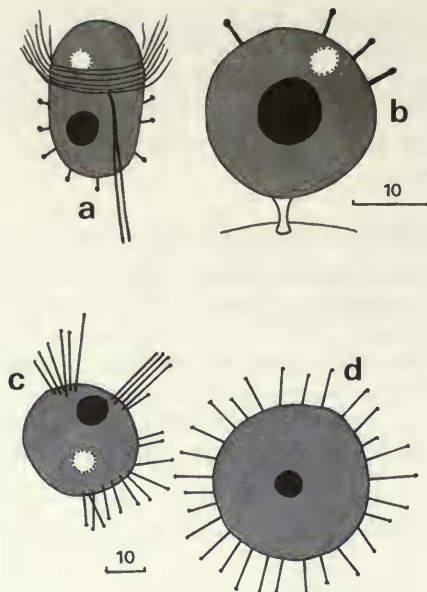
DESCRIPTION (No figure). Medium (90  $\mu\text{m}$  diameter), freshwater, spherical aloricate suctorian. Free-living, attached by tentacles to moss. Tentacles long, capitate and restricted to a single zone on the body surface. Spherical macronucleus located centrally, single marginal contractile vacuole. Reproduction and bud not described and species remains unillustrated.

*Podophrya pusilla* (Claparède and Lachmann, 1859) n. comb.

*Sphaerophrya pusilla* Claparède and Lachmann, 1859

*Sphaerophrya parurolepti* Foissner, 1980

DESCRIPTION (Fig. 26). Small (12–50  $\mu\text{m}$  diameter), freshwater to brackish, spherical, aloricate suctorian. Parasitic on hypotrichous ciliates such as *Oxytricha*, *Stylonychia mytilus* and



**Fig. 26.** *Podophrya pusilla*: (a,b) embryo and adult after Penard, 1920 (called *Sphaerophrya pusilla*); (c,d) adults after Gourret and Roeser, 1886 (called *Sphaerophrya pusilla*).

*Paruroleptus caudatus*. Reported to live on the outside of *Oxytricha* and *Paruroleptus* but the inside of *Stylonychia*. Capitulate tentacles variable in number distributed all over surface of body but in some cases distribution may be rather patchy. Central spherical macronucleus, one or two contractile vacuoles. Reproduction by pseudo-scissiparity. Buds ciliated by about six closely packed transverse rows of cilia with 2 or 3 extra-long trailing cilia. Several rudimentary tentacles located in posterior half of bud.

***Podophrya sandi* Collin, 1911**

*Podophrya* sp. Maupas, 1881

*Podophrya* sp. Simmons, 1889

*Trichophrya gelatinosa* Schewiakoff, 1893

*Acineta gelatinosa* Sand, 1896 non *Acineta gelatinosa* Buck, 1884

**DESCRIPTION** (Fig. 27). Small to medium (30–85  $\mu\text{m}$  diameter), freshwater, spherical to ovoid, aloricate suctorian. Free-living, often, but not always, borne upon a narrow stalk that is approximately the same length as the body. Capitulate tentacles emerge from all over body surface. Spherical macronucleus centrally located, single eccentric contractile vacuole. Reproduction by pseudo-scissiparity. Buds ovoid, bearing 8–10 longitudinal rows of cilia. Cyst spherical with 5 prominent ribs, without stalk.

***Podophrya simplex* (Zacharias, 1893) n. comb.**

*Acineta simplex* Zacharias, 1893

*Trichophrya simplex* Sand, 1901

**DESCRIPTION** (No figure). Small (12  $\mu\text{m}$  diameter), freshwater, hemispherical, aloricate suctorian. Free-living, attached by body to floating chains of *Fragilaria crotonensis*, stalk absent. Tentacles few, only 1 or 2, but measure five times the body diameter. Spherical central macronucleus, single contractile vacuole. Reproduction by pseudo-scissiparity. Buds not described.

**NOTE.** This species has been transferred to *Podophrya* because of its mode of budding. The two genera in the list of synonyms reproduce endogenously.



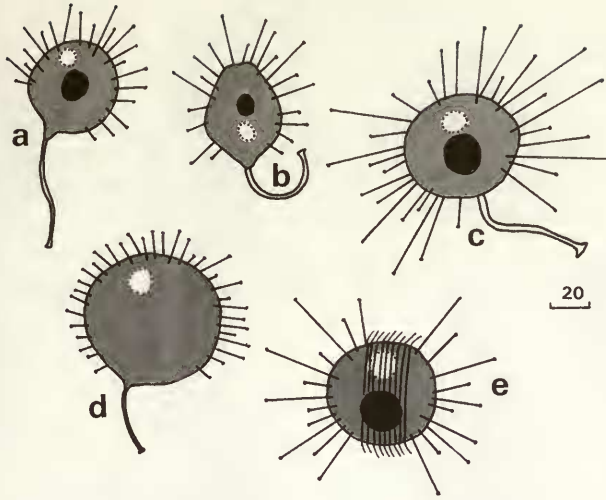


Fig. 27. *Podophrya sandi*: (a-e) various stages in life cycle after Collin, 1912.

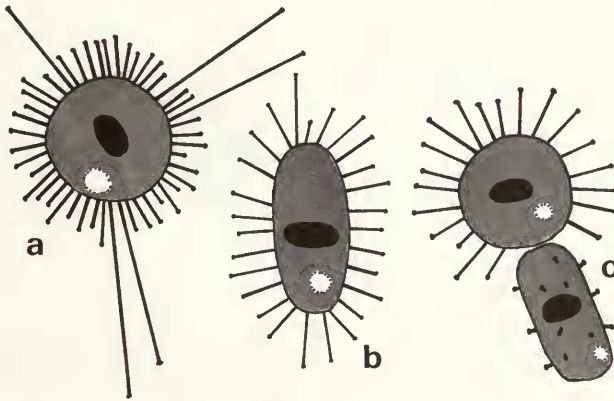


Fig. 28. *Podophrya sol* after Mechnikov, 1864 (called *Sphaerophrya sol*). No scale given.

***Podophrya sol* (Mechnikov, 1864) n. comb.**

*Sphaerophrya sol* Mechnikov, 1864

DESCRIPTION (Fig. 28). Freshwater, spherical aloricate suctorian. Free-living, stalk absent. Many capitate tentacles, approximately half the body length, distributed all over body surface. Additionally there are few long capitate tentacles. Centrally positioned spherical macronucleus and up to three micronuclei. Single marginal contractile vacuole. Reproduction by pseudo-scissiparity resulting in an ovoid bud with rudimentary capitate tentacles. Bud ciliation not described.

NOTE. Although Mechnikov (1864) originally described this species as a free-living suctorian later authorities including Kent (1882) and Collin (1912) misinterpreted his paper. Jankowski (1963) pointed out that Mechnikov (1864) described two suctorians, firstly *Sphaerophrya pusilla* (see *Podophrya parameciorum*) that was parasitic on *Paramecium* and secondly *Sphaerophrya sol* a free-living form.

*Podophrya spenceri* n. sp.*Tokophrya* species 1 Spencer, 1917*Tokophrya* species 2 Spencer, 1917

DESCRIPTION (Fig. 29). Small (10  $\mu$ m long), freshwater, ovoid, aloricate suctorian. Free-living, borne upon stalk that may be branched to form a colony. Stalks two or three times length of body. Tentacles restricted to anterior body surface, few, 4–12, and capitate. Several contractile vacuoles. Reproduction and buds not described.

NOTE. This is a most doubtful species, as there are no other records of a branched stalk in the suctoria and it could be suspected that the organisms seen were perhaps not suctorians but peritrichous ciliates.

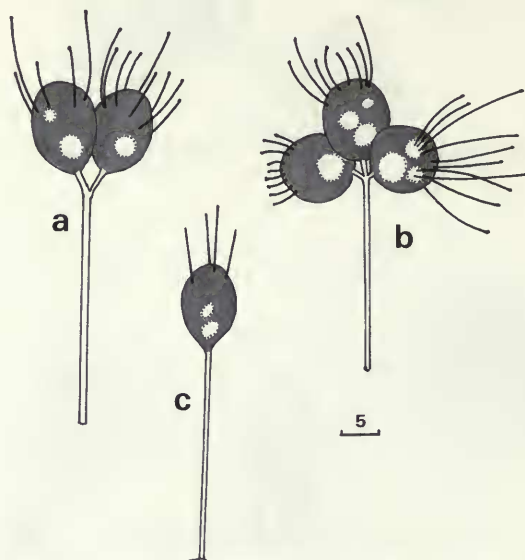


Fig. 29. *Podophrya spenceri*: (a,b) colonial forms (called *Tokophrya* sp. 1); (c) solitary form (called *Tokophrya* sp. 2). All after Spencer, 1917.

*Podophrya stentoris* (Maupas, 1881) n. comb.*Sphaerophrya stentoris* Maupas, 1881*Sphaerophrya stentorea* Sand, 1901

DESCRIPTION (Fig. 30). Small (35–45  $\mu$ m diameter), freshwater, spherical, aloricate suctorian. Parasitic in *Stentor roeseli* and *S. coeruleus*. Adult with few short tentacles. Centrally located spherical macronucleus, single eccentric contractile vacuole. Reproduction by pseudo-scissiparity. Ovoid bud with anterior transverse ciliary rows, several posterior tentacles contractile vacuoles and is prominently waisted by the presence of two transverse grooves.

*Podophrya stokesii* (Mamaeva, 1979) n. comb.*Sphaerophrya stokesii* Mamaeva, 1979

DESCRIPTION (Fig. 31). Small (30–35  $\mu$ m diameter), freshwater, spherical, aloricate suctorian. Ectoparasitic on the exterior of the ciliate *Stokesia vernalis*. Capitate tentacles distributed all over surface of body. Spherical macronucleus, single marginal contractile vacuole. Reproduction by pseudo-scissiparity.

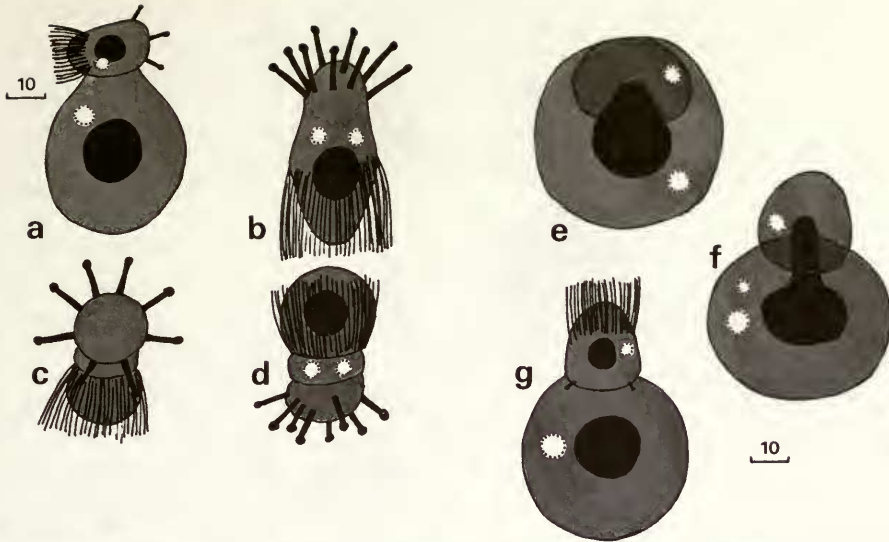


Fig. 30. *Podophrya stentoris*: (a–g) various stages in budding and embryos after Stein, 1867 (called *Sphaerophrya stentoris*).

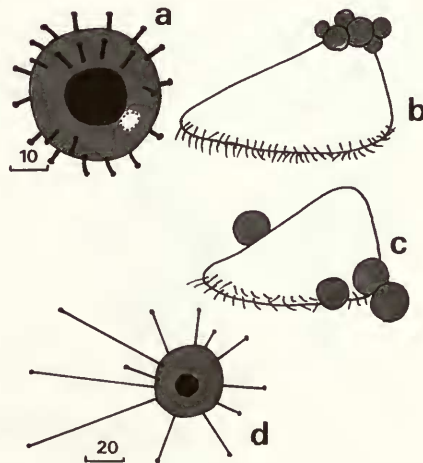


Fig. 31. *Podophrya stokesii*: (a) adult; (b,c) attached to host *Stokesia*; (d) adult. All after Mamaeva, 1979 (called *Sphaerophrya stokesii*).

***Podophrya urostylae* (Maupas, 1881) Jankowski, 1963**

*Sphaerophrya urostylae* Maupas, 1881

*Sphaerophrya stylonychia* Kent, 1882

*Podophrya stylonychia* Foissner, 1980

DESCRIPTION (Fig. 32). Small (30–40  $\mu\text{m}$  diameter), freshwater, spherical, aloricate suctorian. Free-living or endoparasitic in hypotrichous ciliates such as *Urostyla grandis* and *Stylonychia*. Few short capitate tentacles distributed all over surface of body. Central spherical macronucleus, single marginal contractile vacuole. Adult also able to live outside host when it is attached to inanimate objects by means of a stalk. Reproduction by pseudo-scissiparity. Buds ciliated by about six closely packed longitudinal rows of cilia and there are several rudimentary tentacles distributed over the bud. Stalked cyst, approximately ovoid with 4 or 5 transverse ridges.

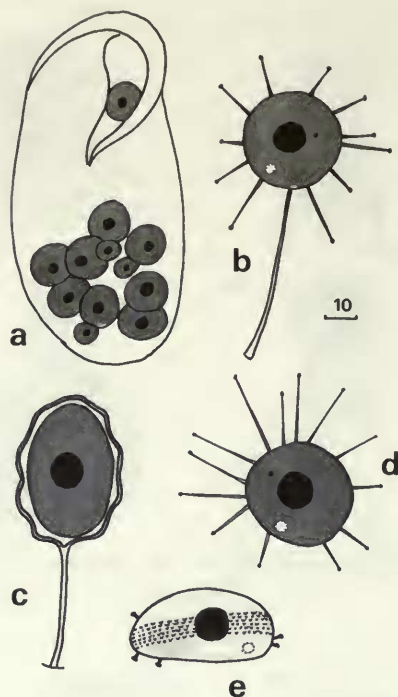


Fig. 32. *Podophrya urostylae*: (a) adults inside host *Urostyla*; (b-e) adult, cyst, adult without stalk and embryo respectively. All after Jankowski, 1963.

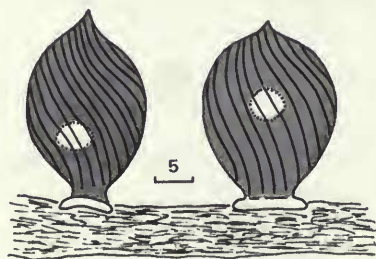


Fig. 33. *Podophrya tortuosa* cysts after Dons, 1918.

### Dubious Species

#### *Podophrya tortuosa* Dons, 1918

DESCRIPTION (Fig. 33). Small (25  $\mu$ m long), marine organism that is potentially a suctorian. Only the cyst has been described and for that reason it cannot be certain that it is ciliate of any kind. Cyst ovoid, anterior pointed, posterior flattened with a rim by which it is attached to the marine polychaete worm *Spirorbis*. Cyst striated obliquely. Single contractile vacuole.

#### Genus *PARAPODOPHRYA* Kahl, 1931

While members of this genus are superficially similar to certain species of *Podophrya* there is a fundamental character that separates the two genera. In *Parapodophrya* an elongated bud carrying an anterior corona of transverse ciliary rows develops by pseudo-scissiparity which is quite



unlike anything produced by *Podophrya*. Furthermore all *Parapodophrya* species are free-living since no parasitic podophryid capable of producing the typical *Parapodophrya* bud has been described. In some cases the tentacles may widen towards their bases but this should not be regarded as evidence on its own that the species in question is a member of the above genus. However in most other respects the two genera resemble each other quite closely since their modes of reproduction, cysts and abilities for total transformation into a free-swimming bud-like state are similar.

### Diagnosis of *Parapodophrya*

Fresh to brackish-water suctorians whose outline shape is typically spherical. Lorica absent, some species borne upon a stalk but this may often be absent. Free-living, usually attached to aquatic vegetation or inanimate objects. Never parasitic. Tentacles capitate and frequently widen markedly towards their base which may give body a serrated to star-like appearance. Tentacles distributed all over body, not in fascicles. Actinophores absent. The only cyst that has been described is stalked and heavily ribbed. Reproduction by pseudo-scissiparity, buds ciliated by a corona of several transverse rows of cilia. Bud typically elongated, wider at the anterior end than bears the ciliary rows. Some buds with rudimentary tentacles in the posterior body half. Whole cell may convert into a motile bud-like state.

### Key to Species of *Parapodophrya*

- |   |   |                      |
|---|---|----------------------|
| 1 | Tentacles noticeably widen at base .....  | 2                    |
|   | Tentacles do not noticeably widen at base .....   | 4                    |
| 2 | Without stalk, bases of tentacles very wide giving body a star-like appearance ... <i>P. sparganium</i> |                      |
|   | With stalk, tentacle bases only moderately wide .....   | 3                    |
| 3 | Macronucleus spherical, zooid spherical ..... <i>P. soliformis</i>                                      |                      |
|   | Macronucleus lemon-shaped, zooid pyriform ..... <i>P. palmigera</i>                                     |                      |
| 4 | Tentacles simply capitate .....   | 5                    |
|   | Tentacle ends broadly spatulate .....   | <i>P. typha</i>      |
| 5 | Zooid covered in short denticle-like projections ..... <i>P. denticulata</i>                            |                      |
|   | Zooid without surface projections .....   | 6                    |
| 6 | With stalk .....  | <i>P. soliformis</i> |
|   | Without stalk .....   | <i>P. nigricans</i>  |

### Species descriptions of *Parapodophrya*

#### *Parapodophrya soliformis* (Lauterborn, 1908) Kahl, 1931

*Sphaerophrya sol* Lauterborn, 1901 non Mechnikov, 1864

*Sphaerophrya soliformis* Lauterborn, 1908

*Podophrya soliformis* Penard, 1918

**DESCRIPTION** (Fig. 34). This the type species is a small to medium (40–100 µm diameter), freshwater, spherical, aloricate suctorian. Capitate tentacles numerous, projecting from all over body surface, fine at the tips and widening towards their bases giving the cell surface a rather serrated appearance. Free-living, usually borne upon a stalk that is at least as long as the body diameter. Stalk joins body via a short cytoplasmic projection. Central spherical macronucleus, single contractile vacuole slightly eccentric. Reproduction by pseudo-scissiparity producing a ciliated embryo which has a corona of several transverse kineties near to the anterior end of the cell and sometimes a few rudimentary tentacles behind the cilia. Similar ciliated larvae can be produced by the total transformation of the adult. Spherical cyst with four transverse ribs, borne upon short stalk.

**NOTE.** This species has been the subject of several papers including Penard (1920) and Kormos (1960) in addition to those given above.

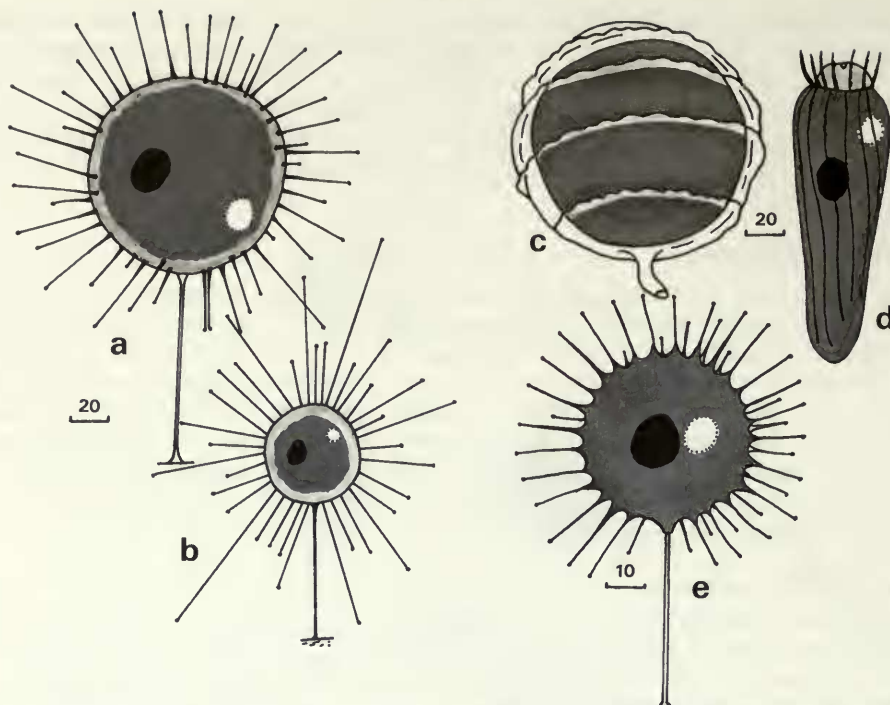


Fig. 34. *Parapodophrya soliformis*: (a,b) adults after Kahl, 1931 (called *Podophrya soliformis*); (c-e) cyst, embryo and adult after Penard, 1920 (called *Podophrya soliformis*).

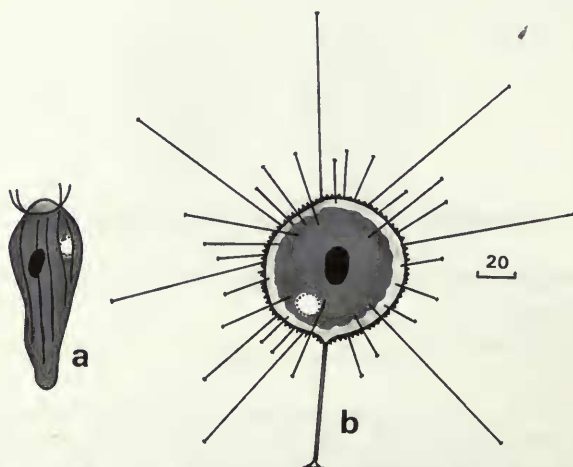


Fig. 35. *Parapodophrya denticulata*: (a,b) embryo and adult after Kahl, 1931.

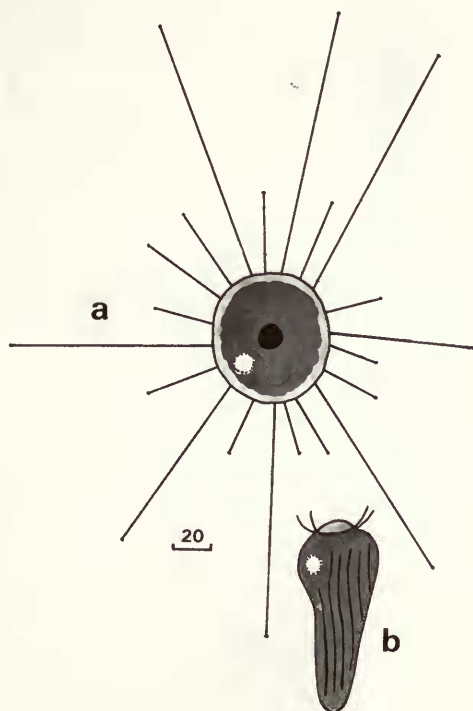
***Parapodophrya denticulata* Kahl, 1931**

DESCRIPTION (Fig. 35). Medium (70  $\mu$ m diameter), freshwater to brackish, spherical, aloricate suctorian. Capitate tentacles numerous, projecting from all over body surface which is covered in short projections giving the cell surface a rather serrated appearance. Free-living, usually borne upon a stalk that is at least as long as the body diameter. Stalk joins body via a short cytoplasmic projection. Central ovoid macronucleus, single marginal contractile vacuole. Reproduction by

pseudo-scissiparity producing an elongated ciliated embryo which has a corona of several transverse kineties near to the anterior end of the cell. Feeds on the ciliate *Spirostomum teres*.

***Parapodophrya nigricans* Kahl, 1931**

**DESCRIPTION** (Fig. 36). Small to medium (50–60  $\mu\text{m}$  diameter), freshwater to brackish, spherical, aloricate suctorian. Long capitate tentacles numerous, projecting from all over body surface. Free-living, not usually borne upon a stalk, body surface smooth. Central spherical macronucleus, single marginal contractile vacuole. Reproduction by pseudo-scissiparity producing an elongated ciliated embryo which has a corona of several transverse kineties near to the anterior end of the cell. Feeds on the ciliate *Prorodon ovum*.



**Fig. 36.** *Parapodophrya nigricans*: (a,b) adult and embryo after Kahl, 1931.

***Parapodophrya palmigera* (Penard, 1920) n. comb.**

*Podophrya palmigera* Penard, 1920

*Podophrya comosa* Penard, 1920

**DESCRIPTION** (Fig. 37). Medium (50–60  $\mu\text{m}$  diameter), freshwater, pyriform, aloricate suctorian. Capitate tentacles numerous, projecting from all over body surface, fine at the tips and widening slightly towards their bases giving the cell surface a rather spiky appearance. Free-living, borne upon a stalk that is at least as long as the body diameter. Body projects out posteriorly at junction of stalk. Macronucleus eccentric, characteristically lemon-shaped, single marginal contractile vacuole. Reproduction by pseudo-scissiparity producing an elongated ciliated embryo which has a corona of several transverse kineties near to the anterior end of the cell.

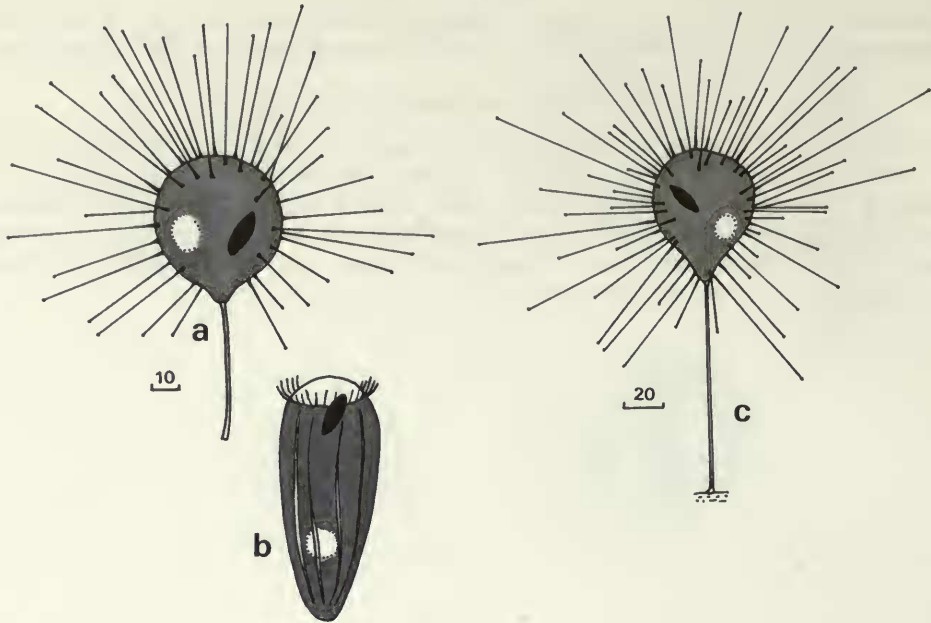


Fig. 37. *Parapodophrya palmigera*: (a,b) adult and embryo (called *Podophrya palmigera*; (c) adult (called *Podophrya comosa*). All after Penard, 1920.

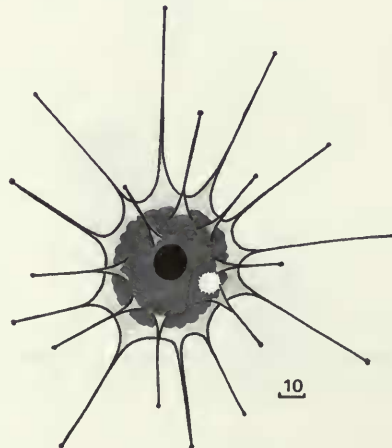


Fig. 38. *Parapodophrya sparganium* after Kahl, 1931.

***Parapodophrya sparganium* Kahl, 1931**

DESCRIPTION (Fig. 38). Medium (50–60  $\mu\text{m}$  diameter), brackish water, irregularly spherical, aloricate suctorian. Capitate tentacles numerous, projecting from all over body surface, fine at the tips and widening considerably towards their bases giving the cell surface a star-like appearance. Free-living, stalk absent. Central spherical macronucleus, single marginal contractile vacuole. Reproduction by pseudo-scissiparity producing an elongated ciliated embryo which has a corona of several transverse kineties near to the anterior end of the cell.



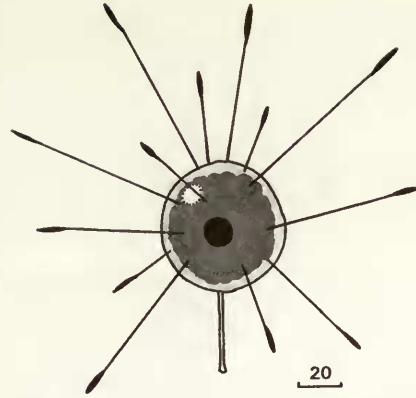


Fig. 39. *Parapodophrya typha* after Kahl, 1931.

***Parapodophrya typha* Kahl, 1931**

DESCRIPTION (Fig. 39). Medium (50–60  $\mu\text{m}$  diameter), freshwater to brackish, spherical, aloricate suctorian. Tentacles with spatulate spear-like ends, projecting from all over body surface. Free-living, usually borne upon a stalk that is almost as long as the body diameter. Body surface smooth. Central spherical macronucleus, single marginal contractile vacuole. Reproduction by pseudo-scissiparity producing an elongated ciliated embryo which has a corona of several transverse kineties near to the anterior end of the cell.

Genus **MUCOPHYRYA** Gajewskaja, 1933

This single species genus closely resembles some of the stalkless species of *Podophrya* and perhaps will eventually become submerged in that genus. However the description of budding is not sufficiently detailed to positively identify it as pseudo-scissiparity or as simple exogenous budding and until that feature is elucidated it should remain as a separate genus. The possession of a thick mucous coat is not in itself thought to be sufficient to sustain its separate generic status since this is possibly a recent adaptation to the planktonic way of life. The saucer-shaped lorica is rather different from other podophryid cysts and this feature tends to strengthen the case for retaining it as a separate genus.

**Diagnosis of *Mucophrya***

Freshwater suctorian whose outline shape is irregular, triangular to heart-shape. Lorica absent but there is a thick layer of mucous covering the only species described to date. Stalk absent. Free-living, planktonic, never parasitic. Tentacles capitate and retractile, distributed all over body, not in fascicles. Actinophores absent. Cyst saucer-shaped with frilled edge, cytoplasmic portion reduced, spherical lying centrally within cyst. Reproduction by exogenous buds.

**Key to species of *Mucophrya***

- 1 Planktonic, covered in thick layer of mucous ..... *M. pelagica*

**Species description of *Mucophrya***

***Mucophrya pelagica* Gajewskaja, 1933**

DESCRIPTION (Fig. 40). Medium (65–110  $\mu\text{m}$  diameter), freshwater, irregular heart-shape to triangular, aloricate suctorian. Tentacles capitate, projecting out from all over body surface, retractile. Free-living, planktonic, without stalk. Body covered in thick mucilaginous coat.

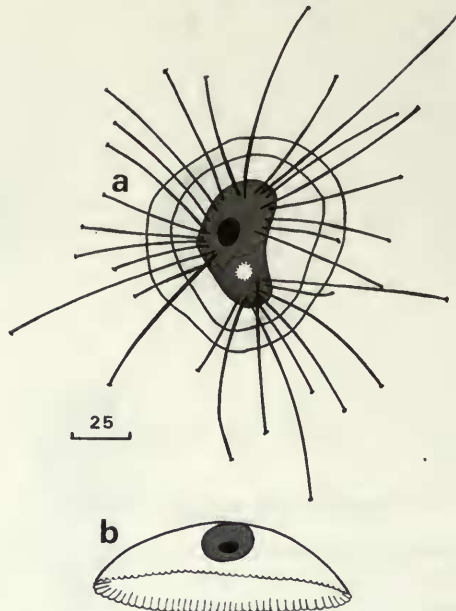


Fig. 40. *Mucophrya pelagica*: (a) adult; (b) cyst. Both after Gajewska, 1933.

Central ovoid macronucleus, two micronuclei, single marginal contractile vacuole. Reproduction by exogenous buds. Cyst saucer-shape, up to 130  $\mu\text{m}$  in diameter, with a frilled edge. Cytoplasm in cyst centrally positioned and spherical.

NOTE. So far only recorded from Lake Baikal.

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